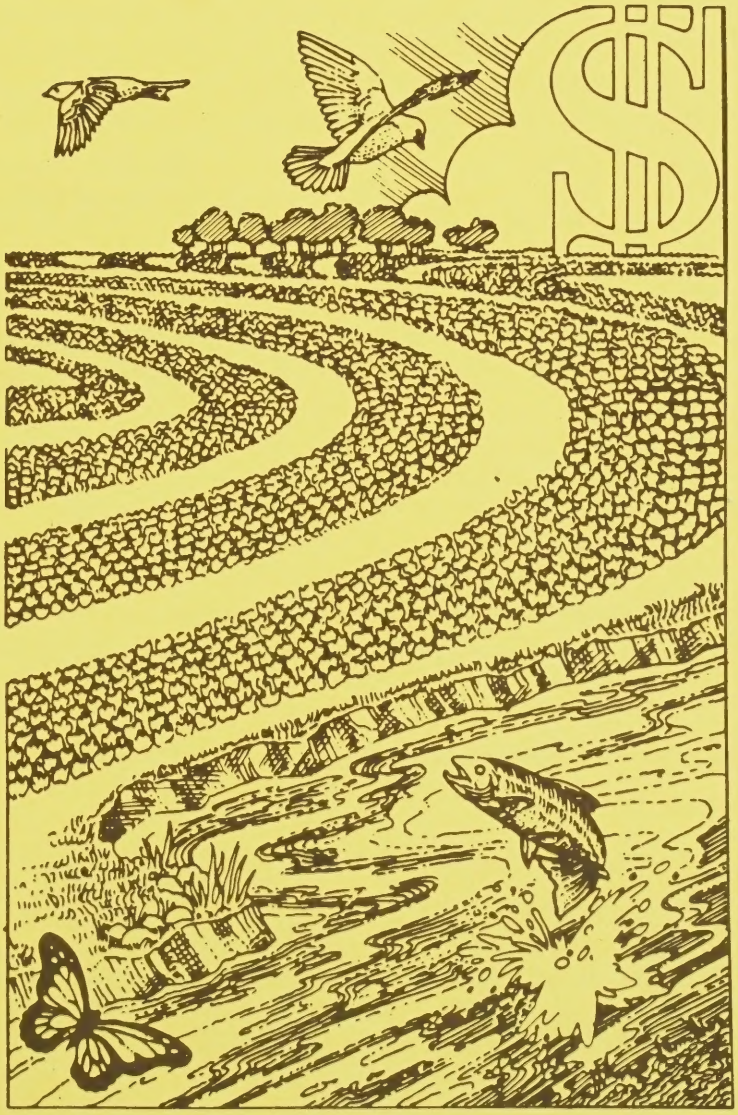
NEBRASKA

North-Central Region Projects Supported by Sustainable Agriculture Research and Education Program



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from project reports

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Overview of Nebraska Projects

Congress has provided strong and growing support for the Sustainable Agriculture Research and Education grants program, also known as LISA (Low-Input Sustainable Agriculture). Administered by Cooperative State Research Service (CSRS), with the Cooperative Extension Service as a full partner, this program is forging partnerships between farmers, scientists, educators, agribusiness, non-profit organizations, and government -- a partnership that is beginning to promote better stewardship of the Nation's natural resource base. The program has supported 112 new projects since its inception in 1988; perhaps two dozen more will be funded by June.

Projects funded are typically carried out by teams of farmers, university research and education staff, government agencies, non-profit organizations, and private enterprise. Top priority is given to whole-farm integrated systems projects, usually including on-farm research and demonstrations. These projects are providing scientific documentation of low-input sustainable farming practices and systems, in comparison with conventional or chemical-intensive agriculture.

Farmer involvement is one of the strengths of this program. There has been active involvement in the administration of the North Central Region LISA program since its inception. Five producers from the region have served on the Administrative Council which develops policy and distributes funds. Six producers have also served on the Technical Committee which evaluates and recommends project proposals for funding.

Nationwide, 1,860 farmers have participated in projects during the first three years. When farmers participate in the planning and execution of a project, two important things happen. Concerns of farmers are foremost in the design of the project. And scientists get directly exposed to innovative ideas developed or tried by farmers. These ideas often become an integral part of scientific studies. The result is both better science and a more widespread adoption of more sustainable farming methods that are economically viable, socially acceptable, and environmentally sound, assuring cleaner water and a plentiful supply of safe food for generations to come.

The coordinators of Nebraska projects were asked about participating farmers. Here is what they reported:

- A total of 92 Nebraska farmers have participated in LISA research and education projects;

- 13 are reported to have helped generate ideas for these projects, and 6 help manage the projects;

- 2 farmers have provided land for replicated experiments; another 6 provided land for unreplicated studies, and 6 for demonstration plots;

- 13 are helping with the evaluation of projects;

- One producer served a 1 year term on the Administrative Council, while a second is now serving a 3 year term; and

- One producer served a 1 year term on the Technical Committee.

Projects Funded 1988-1990

Ten projects funded by this program that include Nebraska scientists, farmers, or educators in major roles are described here. These projects received a total of $1,180,873, and provided $1,249,495 matching funds. In most of the projects, a scientist serves as the Project Coordinator. In others, a farmer or other local area residents are contributing to a multi-state project headquartered in another state.

Beginning Farmer Sustainable Agriculture Project (LNC88-14)

Summary

Young and beginning farmers and livestock are both important components to the success of sustainable agriculture practices. The current trend in livestock production has been to use capital intensive confinement related technologies to concentrate large numbers on large farms while ignoring low-cost sustainable livestock technologies that are appropriate for beginning farmers.

The Center for Rural Affairs has expanded its fourteen year history of working with farm families in developing sustainable agricultural practices to coordinating activities with other sustainable agriculture organizations in the North Central Region. In addition the Center has developed good working relationships with a wide variety of farm organizations and educational institutions. The objective of this project is to develop instructional material on more sustainable crop and livestock production practices that will also help young and beginning farmers enter farming. These materials are being developed in collaboration with cooperating groups and organizations but more importantly with the active participation of young and beginning farmers.

Specific proposed activities include selecting a cooperating group of 25 beginning farmers who will attend workshops and participate in developing sustainable whole farm strategies to enter farming. These strategies will include sustainability as a goal to be pursued by using more sustainable farming practices. A flexible curriculum will be developed that will consist of videotapes, case studies, and fact sheets that will be made available to young and beginning farmer organizations, sustainable agriculture organizations, vocational agriculture programs and the Cooperative Extension Service in the North Central Region.

Project Coordinator: Ron Krupicka, **Center for Rural Affairs**

Major Participants: **Center for Rural Affairs:** L. Krcil; **Nebraska Sustainable Agriculture Society:** S. Welsch; **University of Nebraska:** C. Carlson, D. Usmann

Project Duration: 3 Years

Total Funding: LISA Funds: $72,996; Matching Funds: $93,681

An Economic Analysis of Producer And Industry Level Impacts of Low-Input Agriculture (LNC88-2)

Summary

The purpose of this study is to evaluate the economic impact of using swine manure to meet crop nutrient needs on a typical midwest crop/livestock farm. This study simulates a typical Iowa crop/livestock farm. Crop enterprise choices compare a corn-soybean rotation to continuous corn. The swine enterprise is constrained to a maximum of 90 sows, farrowing twice a year. Various alternatives for fertilizer application are compared. They include commercial fertilizer application or manure application via a liquid spreader, stationary spray gun or delivery cord. Delivery cord is a method in which field injection equipment is attached to a continuous line directly to the manure storage system. Estimation of costs, returns, and labor requirements were prepared through use of Iowa State Extension budgets, existing research, and discussion with producers using their systems. Enterprise budgets were developed and used to evaluate the farm level impacts of sustainable production alternatives.

The farm has 400 tillable acres with a farrow to finish total confinement hog facility. The hog facility has the capacity of 180 litters of hogs per year. Farm implements available, sizes, field capacities and labor requirements used are standard for an Iowa swine/corn operation as suggested by the Iowa Extension enterprise budgets.

All manure is applied and is used to meet nitrogen, phosphorus, and potassium requirements. Commercial application is used to bring levels of nutrients to satisfactory rates when manure supplies are exhausted or uneconomical. Four separate manure application time alternatives were considered. They were: Spring -- Application of all of the manure just prior to planting with immediate incorporation; Spring/Fall -- Application of half of the manure just in the spring, with the remainder applied after harvest in the fall with immediate incorporation; Fall -- All the manure applied after harvest in the fall and immediately incorporated; and Winter -- All the manure applied during the winter. The manure is applied using a 2,200 gallon liquid spreader, a stationary spray gun, or delivery cord.

Project Coordinators: (1) James Kliebenstein, **Iowa State University**; (2) Glenn Helmers and (3) Azzeddine Azzam, **University of Nebraska**

Major Participants: **Iowa State University:** M. Duffy

Project Duration: 1 Year

Total Funding: LISA Funds: $25,000; Matching Funds: $31,824

Sustainable/Low-Input Agriculture: An Overview Videotape (LNC88-4)

Summary

An overview videotape was prepared to describe sustainable agriculture in terms of modified production practices, economics, and environmental impact. This video was directed toward education of farmers and ranchers involved with crop production, students at high school and college level, legislators, agribusiness leaders, and educators within the land-grant system. The general overview videotape of 22 minutes covers tillage systems, alternative approaches to soil fertility and pest management, and applications of new crops.

Project Coordinator: Charles Francis, **University of Nebraska**

Major Participants: **University of Nebraska**: M. Wilhite, J. W. King

Project Duration: 1 Year (project completed)

Total Funding: LISA Funds: $16,800; Matching Funds: $24,187

Low-Input Agriculture and Cover Crop Workshop For Extension and Research Personnel From Nebraska, Iowa, Kansas and Missouri (LNC88-5)

Summary

The workshop provided participants with latest information on various agronomically related subject matter relevant to low-input agriculture. Participants prepared teaching materials appropriate for use in training other scientists and Extension field staff in their respective states. Subsequent training sessions and educational programs for agri-organization leaders and producers followed. As a specific 2-day part of the workshop, researchers from the four states discussed current activities in the area of cover crops and developed research plans for future efforts. A joint session provided an overview of reported cover crop research and general known information outside the region.

Project Coordinator: Zane R. Helsel, **University of Missouri**

Major Participants: **University of Nebraska**: R. Ferguson, R. Selley, C. Francis; **Kansas State University**: D. Whitney; **Iowa State University**: R. Voss

Project Duration: 1 Year

Total Funding: LISA Funds: $16,500; Matching Funds: $4,799

Low-Input Database and Information System (LNC88-7)

Summary

A north central regional low-input agriculture database/information system was developed. The database will then become a part of a proposed national database. Representatives from the 12 north central states will develop plans to organize and produce an interactive computerized database and information retrieval system for low-input agriculture. The system will allow for the input and retrieval of both published and unpublished (reputable information) research and field trial data. The information system may also include references to video tapes, slide sets, calendar of events, etc.

Project Coordinator: V. Shade, **University of Missouri**

Major Participants: **University of Missouri:** Zane R. Helsel;
University of Nebraska: C. Francis

Project Duration: 1 Year

Total Funding: LISA Funds: $5,000; Matching Funds: $5,000

Substituting Legumes for Fallow in U.S. Great Plains Wheat Production (LNC88-10)

Summary

Wheat-fallow production systems have been used for nearly a century in the wheat producing Great Plains states of Kansas, Nebraska, North and South Dakota. In addition to moisture conservation, fallow is also practiced to mineralize nitrogen and control weeds. While stabilizing wheat yields on a bushel per-acre basis, fallow leaves a sizeable acreage idle each year and contributes to wind and water erosion. In other wheat producing areas of the world, such as Southern Australia, cereal grain/legume companion crop production systems are utilized to keep the soil covered, fix atmospheric nitrogen, reduce weed competition, and provide improved grazing potential. Recently, these systems have been explored in the U.S. Palouse and Northern Plains wheat production areas and have exhibited the potential to reduce agrichemical inputs, both conserve and improve the soil resource, and increase net return per acre.

The value of legumes in rotation and as companion crops is well documented in humid areas. Less is known and only limited success has been demonstrated in semi-arid condition with traditional species, such as sweetclover and alfalfa. Alternative species which use less water, such as black medic (*Medicago lupulina L.*), seem feasible in the spring wheat region of central North and South Dakota.

To further identify the potential of legumes replacing fallow in the wheat production areas of the U.S. Great Plains, a number of locations have been identified which represent a continuum of moisture stress, from the most humid (north and east) in North Dakota, to the most arid (south and west) in Kansas. In the most humid region, 10 farmers are cooperating to test alternative legumes (primarily black medic and sweet clover) and alternative legume management systems in large, replicated plots. These sites are serving as a research and demonstration source for utilization by an on-farm research coordinator from the Michael Fields Agricultural Institute, State Extension Services, and the Northern Plains Sustainable Agriculture Society. Small plot and feasibility research on black medic and other alternative legumes and production systems are being conducted on experiment stations by North Dakota State University at Carrington, University of Nebraska at North Platte, and by Kansas State University at Tribune. On-farm sites will require from two to four years to assess the value of the self-perpetuating black medic.

Project Coordinator:	John C. Gardner, **North Dakota State University Carrington Research Extension Center**
Major Participants:	**North Dakota State University Carrington:** B. Schatz, V. Anderson; **NDSU:** D. Watt; **Wisconsin Michael Fields Institute:** S. Guldan; **Kansas State University:** J. Havlin, A. Schlegel; **University of Nebraska:** R. Klein
Farmers:	**North Dakota:** D. Podoll, K. Ableidinger, C. Nelson, D. Dufner, T. Jacobson, D. Thomas, B. Neevel, E. Haakenson, D. Montgomery; **Minnesota:** C. Fernholz
Project Duration:	Started in 1988; now in fourth year.
Total Funding:	LISA Funds: $341,000; Matching Funds: $271,139

The Middle Border On-Farm Research Consortium (LNC88-11)

Summary

The key participants in this project are more than 100 farmers in Kansas and Minnesota, working closely with members of private organizations and universities. The project is coordinated by Patrick Moore of the Land Stewardship Project in Minnesota. "The Middle Border On-Farm Research Consortium" includes the team members from the Kansas Rural Center, the Nebraska Sustainable Agriculture Society, and the University of Nebraska. The "Middle Border" area is defined as southwest Minnesota, eastern South Dakota, Nebraska, and northeast Kansas.

The distinguishing feature of this project is that the Consortium relies primarily on grass-roots input from local farmer networks to determine what research is to be done and how to carry it out. These emerging networks provide important social support to farmers attempting to make the transition from heavy dependence on synthetic chemical pesticides and other purchased inputs to low-input farming systems. The farmer networks also serve as focal points for technology transfer in disseminating scientific findings from experiment stations and other institutional research to farmers. The Consortium is bridging the gaps between farmers, researchers and private non-profit organizations in order to foster the widespread adoption of ecologically sound, profitable, and sustainable farming practices throughout the Middle Border region.

Now in its third growing system season, the Consortium's farmer networks are carrying out on-farm research and demonstrations on a wide variety of economically and environmentally sound farming practices such as the following:

- Assessing the farmer usability of an on-farm soil nitrate testing kit;
- Research and demonstration comparing the capabilities of raw manure, compost, and legumes to build and maintain soil fertility;
- Use of the rotary hoe rather than herbicides for control of weeds in row crop production;
- Overseeding of legumes as a winter cover crop and a spring plowdown green manure;
- The use of moisture conserving legumes in crop rotations and as interseeded crops with small grains.

Project Coordinator: Patrick J. Moore, **Land Stewardship Project**

Major Participants: **Land Stewardship Project:** A. Arner; **University of Nebraska:** C. Francis, **Nebraska Sustainable Agriculture Society:** S. Welsch; **Kansas Rural Center:** J. Jost

Farmers: Minnesota: L. Olson; **Kansas:** E. Reznicek

Project Duration: 3rd Year continuation of funding

Total Funding: LISA Funds: $296,277; Matching Funds: $338,895

Low-Input Beef Cattle Systems of Production (LNC88-19)

Summary

The areas of southern Iowa, northern Missouri and eastern Nebraska are similar in erodability of the soils, the mix of row crops and pastures on most farms and the production of beef as cow/calf or yearlings. Because of their unique ability to utilize forages, beef cattle fit into such a farming system. Beef producers can become more competitive by increasing the economical use of forages and by reducing input costs. Dramatic savings could be realized without greatly reduced output by:

- maximizing use of forage,
- minimizing use of grains,
- maximizing grazing,
- minimizing harvesting, and
- minimizing purchased supplemental feed.

Year round beef production systems are being tested in Nebraska, Iowa and Missouri. Research at the University of Nebraska has shown that grain feeding can be cut in half by using an extensive, low input, high forage system of grazing and finishing cattle. The grain needed per lb of gain was reduced from 5.3 to 2.4 lb. Better yet, the cost of weight gain was $.08/lb lower on the forage system.

The "summer slump", due to poor growth when cattle are grazing endophyte infested fescue, was solved by investigators at the University of Missouri by grazing sorghum sudan, warm-season grass or endophyte-free fescue. By interseeding sorghum sudan into endophyte infected tall fescue sod, the reappearance of tall fescue in the fall was minimal. This grazing system provides the producer with an opportunity to kill an infected stand without sacrificing the opportunity to graze animals on these pastures during the summer. The renovated pastures can then be seeded to an endophyte free variety of tall fescue.

In studies conducted at Iowa State University, rotational grazing of an alfalfa-grass pasture resulted in greater total calf production while not affecting the growth of individual calves. It also led to an increase in the percentage of legume in a pasture, possibly due to reduced competition with grasses and the rest periods for the legumes which occur in rotational grazing. Cow gains on corn stalks were related to stocking rate and gains were improved by strip grazing. In general, better management gave better cattle performance and greater returns.

The results from this research were presented at a national symposium in April 1990, co-sponsored by LISA and the National Academy of Sciences, and at a three-state symposium in June, 1990. A variety of articles and newsletters also carried the results. Future studies will focus on:

- improving grazing gains by including summer annuals, alfalfa, supplementation and extending the grazing season,
- determining whether summer annuals can be no-tilled into tall fescue sod,
- comparing winter grazing of stockpiled tall fescue pastures with drylot feeding of hay on subsequent gains by backgrounding steers to reduce the need for purchasing winter feed, and
- further comparison of continuous, rotational, and strip-grazing of pastures to determine the economic, energetic and nutrient inputs into each of the systems.

Project Coordinator:	Terry Klopfenstein, **University of Nebraska**
Major Participants:	**University of Nebraska:** J. Gosey, R. Rasby, B. Anderson, R. Stock, G. Pfeiffer; **University of Missouri:** J. Paterson, J. Whittier, M. Kerley,
Iowa State University:	J. Russell, A. Trenkle, D. Loy, D. Stobehn, W. Wedin J. A. Hallam, S. Barnhart
Agricultural Research Service:	J. Forwood
Project Duration:	1 Year funding (5 years total 1988-1992)
Total Funding:	LISA Funds: $152,500; Matching Funds: $270,011

Utilization of the Allelopathic Properties of Winter Rye as A Method of Weed Control in Soybean production (LNC88-21)

Summary

A two-year field study was initiated in 1989 by scientists with the Rodale Institute and the University of Wisconsin. Three experiments were done at the University of Wisconsin's Arlington Research Farm, and at seven on-farm sites throughout the Midwest. The purpose of this project was to determine the effectiveness of a cover crop (winter rye) to control weeds in soybean production. Various methods of managing the rye cover crop were examined. A major challenge is to terminate the rye cover crop in a way that will retain its allelopathic weed control power, while avoiding a regrowth or "retillering" of the rye that could tower over the soybeans, greatly reducing their yield.

In the *first experiment*, fall-planted winter rye was killed via three methods (glyphosate, mowing and tillage) and at three different growth stages (tillering, boot, and pollination). Rye that was killed with herbicide (glyphosate) plus mowing adequately controlled weed populations equal to the herbicide treatment checks. Rye killed by chisel plowing did not adequately control weeds at any stage. The exception was that rye killed at the tillering stage with glyphosate exhibited a significant decrease in weed control compared to herbicide checks, perhaps due to the lower quantity of rye biomass.

The *second experiment* conducted at Arlington evaluated rye and oat in combination with a hairy vetch companion crop for weed control in no-till soybean. The oat winter-killed (as expected) and the rye was killed with glyphosate. There was no difference in percent weed control between the narrow row soybean planted into rye and the narrow row or wide row soybean with no cover that received an application of a pre-emergence herbicide. The weed control for all these treatments ranged from 88 to 95% control.

The *third experiment* evaluated four herbicides and cultivation for their ability to control rye which re-tillered after mowing in the boot stage. The objective was to enhance the allelochemical control of annual weeds by allowing additional rye biomass accumulation after planting soybeans in 30" rows. All grass herbicides, applied 14 or 21 days after mowing, adequately (83%) controlled the re-tillering rye regardless of rate. Cultivating two times controlled the rye at levels comparable to the grass herbicide treatments. A single cultivation and glyphosate, applied prior to mowing, had slightly higher weed control (98%), than all other treatments except the glyphosate-only treatment. Weed control was enhanced when herbicides were applied later in the season.

Description of Participating Nebraska Farmer

Gary and Paul Zicafoose (Mead, NE). One thousand acres of corn and soybean are raised on this eastern Nebraska farm, utilizing numerous cover crops. In both the control plots and the rye plots, soybean stands were very poor, due to planting restriction in the rye and low rainfall. Weed populations were also very low in both systems.

Project Coordinator:	James Tjepkema, **Rodale Institute**
Major Participants:	**University of Wisconsin:** J. Doll, T. Bauer
Farmers:	**Iowa:** R. Thompson; **Michigan:** R. Fogg; **Missouri:** R. Harmon; **Illinois:** T. Holsapple; **Ohio:** R. Bennett; **Wisconsin:** J. Bauer; **Nebraska:** G. Zicafoose
Project Duration:	2 Years
Total Funding:	LISA Funds: $60,150; Matching Funds: $50,709

Agronomic and Economic Analyses of Alternative Small Grain/Row Crop Production Systems for the Northern Plains (LNC88-9)

Summary

This project is a continuation of a long-term investigation of alternative, low-input agriculture initiated in 1984 by South Dakota State University. The overall objective of this multi-disciplinary effort is to compare the agronomic and economic sustainability of alternative, conventional, and reduced-tillage farming systems. The alternative systems use primarily on-farm resources to meet crop nutrient needs and to control pests. One complete cycle of all crop rotations in the replicated experimental systems was completed in 1988. Investigations include agronomic and whole farm economic analyses of the experimental farming systems and also of producers' systems.

Objectives

(1) Measure inputs, yields, soil physical and biological properties, earthworms, mycorrhizal associations, and pests. Farming systems are being modeled to determine whole farm impacts in regard to labor and managerial requirements, farm production costs, profits, solvency, and liquidity.

(2) Estimate the effects of different livestock enterprises, Federal Farm program provisions, crop yields and prices, and agrichemical prices are included in the models.

(3) Analyze transition effects and of comparisons of alternative and conventional farms will be completed.

(4) Continue networking with Minnesota, Montana, Nebraska, and South Dakota, and the Northern Plains Sustainable Agriculturral Society.

(5) Continue extending information through field tours, progress reports, producer/research workshops, media news releases, newsletters and journals.

Project Coordinator:	James D. Smolik, **South Dakota State University,** Plant Science Department, Box 2109, Brookings, SD 57007
Major Participants:	**South Dakota State University:** George Buchenau, Thomas Dobbs, Diane Rickeri, Donald Taylor, and Leon Wrage
Cooperators:	**University of Minnesota:** Kent R. Crookston; **North Dakota State University:** John C. Gardener; **South Dakota State University:** Robert G. Hall, David D. Walgenbach; **University of Nebraska:** Warren W. Sahs; **Montana State University:** James R. Sims
Conventional Farmer:	**South Dakota:** Kris Johnke
Low-input Farmers:	**South Dakota:** Allan Johnson; Charles Johnson; **North Dakota:** Fred Kirschenmann, President of Northern Plains Sustainable Agricultural Society, Windsor, **ND**
Project Duration:	Started 1988, now in fourth year.
Additional Funding:	September 1, 1992
Total Funding:	LISA Funds: $194,650; Matching Funds: $159,250